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ABSTRACT

This document (1) describes current PPBS techniques and their limitations for planning and budgeting in public higher education; (2) presents suggestions for PPBS applications in higher education systems, with emphases on the problems of identifying objectives, evaluating effectiveness, and structuring the program budget; and (3) analyzes the effects of PPBS implementation on the organization of the system, with special references to authority structures and power redistribution. (Author/RA)

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THE USE OF PPBS IN A PUBLIC SYSTEM OF HIGHER EDUCATION: IS IT "COST-EFFECTIVE?"

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THE USE OF PPBS IN A PUBLIC SYSTEM OF HIGHER EDUCATION: IS IT "COST-EFFECTIVE?"

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INTRODUCTION

Systematic approaches to decisionmaking and resource allocation seem to be least developed in those areas, such as public higher education, in which the potential returns from such techniques may be the greatest. Although such a situation may seem paradoxical, its results impact from the desire of individuals to select problems for study of such a nature that tractable models and elegant mathematical techniques can be applied to achieve uncontestable results. Unfortunately, most public systems are classified by systems analysts as "ill-structured," and do not possess the clear input-output relationships required for complete mathematical modeling. However, some significant steps are being taken toward increasing the adequacy of the analytic study of complex, large-scale systems.

For example, the conventional myopic techniques of planning and budgeting in higher education are being augmented by the newer theories of PPBS, an acronym for Planning-Programming-Budgeting System. This term will be used to denote the combined activities of structuring a program budget, generating alternative systems designs, evaluating alternative systems, and allocating scarce resources. For an introductory discussion of PPBS, see the work by D. Novick.(1)

Several public institutions of higher education, including the University of California, the Ohio State University, and the University of Pittsburgh, have adopted PPBS, or at least the program budgeting feature of the total, systematic approach to planning, as the conceptual

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framework for the analysis of their activities. Unfortunately, the experience of these institutions is not yet sufficient for a complete evaluation of the system. Therefore, the following question is still one of legitimate concern: Is the use of PPBS within a public system of higher education a fad, or does it provide enough additional, relevant information to justify the alteration of an existing budgeting system? In the language of PPBS, is its use in higher education "cost effective?"

One of the first things that an analyst learns to appreciate is that all questions cannot be answered quantitatively on a cost-effectiveness basis. This latter question pertaining to the value of PPBS is of this nature. The answer will depend on the status of the individual system, particularly with regard to its size and complexity, the availability of resources, the availability of trained personnel, the attitude of the administrators and faculty, the degree to which the existing planning and budgeting system is considered inadequate, and other factors.

The costs associated with the use of PPBS will include the costs of hiring or training analysts, the costs of acquiring and synthesizing new data, and, most importantly, the monetary and nonmonetary costs associated with altering the roles and functions of an existing organizational structure and decisionmaking process. These costs, it should be noted, may be substantial.

The remainder of this paper will consist of a qualitative discussion of the potential benefits to be derived from the use of PPBS in public higher education. The discussion is divided into three primary sections. The first section will briefly describe the existing classical techniques of planning and budgeting for public systems of higher education. The limitations inherent in these approaches will be considered. The second section will present suggestions for the application of PPBS to a public higher education systems. The problems of identifying the objectives of higher education, of developing satisfactory measures of effectiveness for evaluating the attainment of these objectives, and of structuring a program budgeting format that will assist decisionmaking with regard to resource allocation will be described.

The third section will be concerned with the effect of PPBS on the relationships between the organizational units of the system, with particular emphasis being placed on questions of authority and power redistribution.

EXISTING BUDGETING TECHNIQUES--A CRITICAL APPRAISAL

The primary considerations in the classical planning and budgeting techniques of public systems of higher education are the following: (1) efficiency, (2) reaction to environmental demands, and (3) comparison with peers. This section will examine the implications of this situation.

Efficiency

By emphasizing efficiency, the planner in higher education concentrates analysis on such ratios as cost per full-time equivalent student (FTE), student-faculty ratio, cost per student credit hour (SCH), percent of usage of classroom space, etc. Certainly, this discussion does not mean to imply that "inefficient" operation in terms of these statistics is desirable. To the contrary, the efficient pursuit of proper objectives is to be expected; however, the "efficient" operation of a system which is not properly designed to achieve its primary objectives can hardly be considered "efficient" in a global sense. The reliance on these statistics for planning and operating decisions can screen or cloud the perception of the purpose and responsibilities of a system of higher education.

An emphasis on efficiency instead of on the objectives of an organization may be the result of an attempt to circumvent the problems inherent in the identification of the goals of higher education and their related measures of effectiveness. An extension of this approach has been used in a previous application of PPBS to higher education. The basic philosophy implied by a logical adherence to the criteria of efficiency is that the "ends" of an organization are really the last "means" and that there can be no separation of goals and objectives from the approaches and operations used to reach them; thus the

question of differentiation between outputs and objectives becomes purely academic and requires no answer.* This philosophy may have considerable merit for planning over a short time period. However, in the dynamic environment of higher education, the use of this approach in planning over a time horizon of several years could lead to a tragically myopic result. To note an obvious parallel from private industry, even the most efficient producers of such items as buggy whips and trolley cars were doomed to a slow demise. Although these industries were stifled by technological changes, who is to say that the social and cultural changes of the 1960s may not have even greater ramifications in institutions of higher education?

Reaction to Environmental Demands

A second technique of planning and budgeting in public systems of higher education is based on projections of enrollment. One of two methods of enrollment projection is generally used. In the first, the historical enrollment data are used as the basis for "fitting" a trend line that is projected into the future. In the second, estimates are made of the number of high school graduates in an area in future years, and a ratio, based on historical data, is applied to these figures to develop enrollment estimates. The same "ratio" technique may be used to obtain estimates for each institution, and, within each institution, for each grade level and program. A desired student-teacher ratio is then assumed, and a complete budget including estimated faculty needs and costs is produced as a result.

Reliance on such techniques implies that institutions of higher education are passive in nature, and only react to the demands of potential students. In actuality, this conclusion is not valid. Research has shown that policy questions, especially those having economic implications for potential students, may significantly affect enrollments.(2) Obviously, the raising or lowering of admission policy standards can alter enrollments. Less obviously, changes in the

*See p. 4 of Ref. 2.

quality of education or in the programs and courses offered by an institution can have a similar effect. While enrollment projections do provide useful information, the really important questions require decisions which may destroy their validity. A more complete understanding of these relationships is required.

Comparison with Peers

The use of such statistics as the student-teacher ratio was discussed previously with respect to both evaluating system efficiency and determining future budgets as a consequence of their application to enrollment projections. The method for selecting the "proper" or "desirable" ratio will not be considered.

The most commonly used technique for ratio selection is a comparison with the operation of "peers." Institutions of "similar" size in states with "similar" socioeconomic conditions are chosen for a comparative analysis. In most cases, several such institutions are selected and ratios such as student-teacher are computed for each. Ignoring the problems of determining the criteria sufficient for the proper identification of a "similar" institution, we will only consider the use of the results.

Those who espouse the provision of "adequate" education by the state may consider the mean, or perhaps the median or mode, of these ratios to be a desirable figure. Unfortunately, those concerned with efficiency may feel that the highest student-teacher ratio in the group should be selected as a standard, while those concerned with educational quality may prefer the lowest. Thus, the problem is not actually resolved.

Further consideration makes the use of this technique appear even more suspect. What if each of these other institutions also determines their "key ratios" by comparison with "similar" institutions? Although this situation may seem ludicrous, there can be little doubt that it does exist, at least to a limited extent. Surely, this must quality is a classic example of "the blind leading the blind."

The following section will be concerned with the development of a more logical, objective-oriented system for planning in higher education.

PPBS

The essential activities involved in the application of PPBS are the following: (1) the identification of objectives, (2) the organization of activities into programs designed to achieve these objectives, and (3) the analysis of alternative systems designs to develop the final resource allocation. The following discussion will consider the potential contributions of each of these activities in a public system of higher education.

Objectives and Measures of Effectiveness

One of the most important steps in the use of PPBS involves the proper identification of system objectives. The significance of this activity is magnified by the fact that alternative system configurations and resource allocations will be evaluated according to their contributions to objective attainment. Unfortunately, the objectives of higher education are complex, and are not clearly defined.

For example, the higher education system may be identified as part of a larger system involved in the production and distribution of knowledge, a function which may be considered to be a valid goal, and to be independent from its importance as a means to the attainment of other objectives. Higher education is also involved in the creation of human capital. In this respect, higher education may be viewed as an investment whose purpose is the creation of a skilled labor force that will provide additional personal income to the participants while contributing to economic growth, prosperity, technological advances, and the national security. Education has also become a source of social mobility, which is generally considered to have great social value and to be a legitimate objective of a government. In addition, education provides students with the joys and satisfaction of learning; in this latter respect, expenditures on education must be regarded as consumption. Other functions, such as preserving the culture of a society, may also be considered as objectives of education.

In order to provide a basis for discussion, the objective-oriented framework for public higher education will now be proposed based on a

narrative concept of the role of higher education within a state. These comments are not definitive and are only offered as an example of the approach that should be taken, not the final result.

The goals of a public system of higher education may be conveniently divided into two distinct types. The first, which we will designate as primary objectives, denote the results which are expected to be achieved by the educational system. These primary objectives could include the following:

I. Student Development
   - A. Developing political maturity
   - B. Developing social maturity
     1. basic intellectual skills
     2. individual development
   - C. Developing the capacity for economic achievement
     1. educators
     2. industrial
     3. public service
     4. arts
     5. other professional programs

II. Expansion of Knowledge
   - A. Applied research
   - B. Theoretical research

III. Public Service

The second form of objectives, which we will define as constraining considerations, relate to policy matters which are not actual functions of the educational system and which can seldom be analyzed objectively in terms of their value. Although not exhaustive, a list of these constraining considerations might include the following:

1. The system should not discriminate on the basis of race, sex, religion, social status, or wealth;
2. The system should avoid dehumanization;
3. The percentage of out-of-state students should remain above 20 percent but below 35 percent;
4. The system should maintain a "high" quality of education.

For illustrative purposes, we shall assume that the above lists of primary objectives and constraining considerations are valid for the higher education system of a particular state; they should now be associated with quantifiable measures of effectiveness. Unfortunately, due to the nature of the educational process, the degree of quantification of results will differ among the categories. For example, economic contributions can be estimated more easily than political and social returns.

The first primary objective is that of assisting the political, economic, and social development of the students. The results of political and social development defy complete quantification. Of course, one may be able to infer some relevant information with regard to political development from a study of the voting rates among college graduates versus noncollege graduates, and from a study of political activism as measured by participation in campaigns and political parties. Also, the degree to which college educated persons seem to be better informed on national and local political issues may be considered significant. In addition, standardized tests could be administered to determine if certain basic facts and concepts have been conveyed to the students. Such tests would also represent a source of valuable data for a cost-effectiveness evaluation of teaching methods. Finally, the actual percentage of college work which the "average" graduate takes in areas relating to political development, such as history, government, and political science, may be a helpful, although not ideal, measure. This latter measurement is actually an "input" from the system to the student; ideally, we wish to measure the effects of these inputs. However, when the assessment of effects is difficult, information on inputs may serve as a less desirable aid to decisionmaking.

Similar problems arise in estimating the results and value of attempts at social development. Research related to this problem might involve efforts to determine the degree of job satisfaction, the self-image, the self-perception, etc., of college educated persons versus noncollege educated persons. Other indications, such as comparative crime rates, may also be relevant. Research into questions concerning the effect of higher education on a person's appreciation of the arts,

as revealed through his reading and leisure habits, may also produce significant results. Unfortunately, such suggestions as the latter are loaded with value judgments, and imply, perhaps, that it is "better" for an individual to spend a Sunday afternoon at the symphony than at a professional football game. Extreme care must be taken in the interpretation of such results.

Economic contributions, although presenting difficulties, are much more amenable to measurement. The economic returns to individuals and to the state may be estimated through discounted expected future earnings.[2,3]

The secondary primary objective, expanding knowledge, includes a suggested categorization into "applied" and "theoretical" research. Applied research may be directed toward solving problems of immediate concern, such as pollution, transportation, national security and defense, etc. Theoretical research may be considered to include efforts to expand man's knowledge without regard to immediate returns. Much of the research in the humanities may fall into this category. Although the relationships are admittedly weak, some evaluation of the success of these efforts may be derived from the resulting patents and publications.

Public service activities include consulting on immediate problems, the provision of continuing education for the professions, and the provision of a center for art and cultural activities on campus. Although difficulties would be involved, measures of effectiveness similar to those previously suggested could be developed.

The set of constraining considerations also requires the development of some measures of effectiveness to insure that the proposed system alternatives do not infringe on policies. For example, a breakdown of enrollment by socioeconomic backgrounds could produce valuable information related to policy questions. In particular, any modifications or policy changes involving economic considerations either directly, as via tuition rates, or indirectly, as through the location of additional institutions, should be evaluated in terms of their effects on enrollment. Of particular importance should be an estimate of the proportion of the population that is effectively "priced out"

of the system. For example, research has shown that approximately 20 percent of the eligible college-age population of Texas cannot be expected to attend an institution of higher education unless they can commute to a public facility.(2)

A restatement of the primary objectives appears in Table 1, along with some suggested measures of effectiveness. The following section will discuss the implications of these objectives on the develoment of a program budgeting structure.

Format of Program Budget

The format of a program budget should be flexible enough to provide assistance in the analysis of questions relating to different problem areas. In particular, the format should allow determination of what is done, when it is done, and to whom. The effects of these actions are evaluated in the creation of the budget.

With respect to the first consideration, the budget should be classified by programs. These programs will be the same as those objectives shown in Table 1; each program will consist of a set of program elements whose combined activities promote the accomplishments of one of the objectives. One additional program, Support Activities, will be required to include those activities not directly related to the accomplishment of any of these objectives, and therefore, not amenable to logical allocation among them. This inability to allocate "indirect costs" should not be considered to pose a problem, as only incremental costs resulting from system modification are of primary importance. However, changes within the primary objective-oriented programs may effect these support costs: these incremental cost differences should be estimated for the purpose of system comparison.

If possible, the "program elements" should consist of the existing and proposed departments and colleges of the institutions. Of course, the process of programming may emphasize the need to combine some existing departments, separate others into new departments, and increase or decrease the size of others. Unfortunately, some of the "program elements" may require the artificial division of departments.

Table 1

OBJECTIVES AND MEASURES OF EFFECTIVENESS

Objectives	Measures of Effectiveness
Student Development	e_1 = Instruction
Political development	e_{11} = political effectiveness
	e_{111} = voting rate
	e_{112} = participation
	e_{113} = informed on issues
	e_{114} = standardized test scores
	e_{115} = percent of courses
Social development	e_{12} = social effectiveness
	e_{121} = job satisfaction
	e_{122} = self-image
	e_{123} = crime rates
	e_{124} = participation in culturalactivities
Economic development	e_{13} = economic effectiveness
	e_{131} = economic returns to individual
	e_{132} = economic returns to the state
	e_{1321} = economic returns to the state economy
	e_{1322} = economic returns from increased tax revenue
Expanding Knowledge	e_2 = Research
Applied research	e_{21} = answers to questions
	e_{211} = patents
	e_{212} = contracts
	e_{213} = publications
Theroetical research	e_{22} = general investigation
Public Service	e_3 = Service
	e_{31} = consulting
	e_{32} = workshops
	e_{33} = public cultural activities

Such a case could occur when lower level course offerings in an area are designed for the social or political development of students, but higher level courses in the same area are intended for the development of professional competence.

Emphasizing planning rather than mere budgeting, the use of PPBS requires estimates of when changes are to be made in a system. Once a goal or desired system configuration has been determined, the steps required to attain the necessary modifications in the existing system can be time-phased in the budgeting plans of the future so that a logical, step-wise progression toward the goal is accomplished. The speed with which the existing system is transformed should be a function of available resources and the degree to which the existing system is deemed inadequate.

The question of to whom the advantages of higher education are made available can be considered from two aspects. The first logical categorization is by level. The number of students at the freshman-sophomore levels, junior-senior levels, and graduate levels can have a significant impact on resource requirements.

The second important categorization relating to the students is by socioeconomic characteristics. These figures are required for evaluating the effects of proposed system alterations on those "constraining considerations" relating to policies against discrimination, de jure or de facto.

Not all of these suggested categories will be important in every use of the program budget. However, the budgeting format should be made so flexible that any of the breakdowns may be used in any order. Such a requirement would probably necessitate the use of the computer. However, the activities of planning and budgeting will make other demands requiring computorization of data, so that this additional programming requirements should not be considered excessive.

The effects of the proposed multiclassification scheme are shown graphically in Fig. 1. An abbreviated budget format is shown in Table 2. This table uses programs as a primary category, educational level as the secondary category, and program elements as the third. Other perturbations of the suggested classifications are also possible.

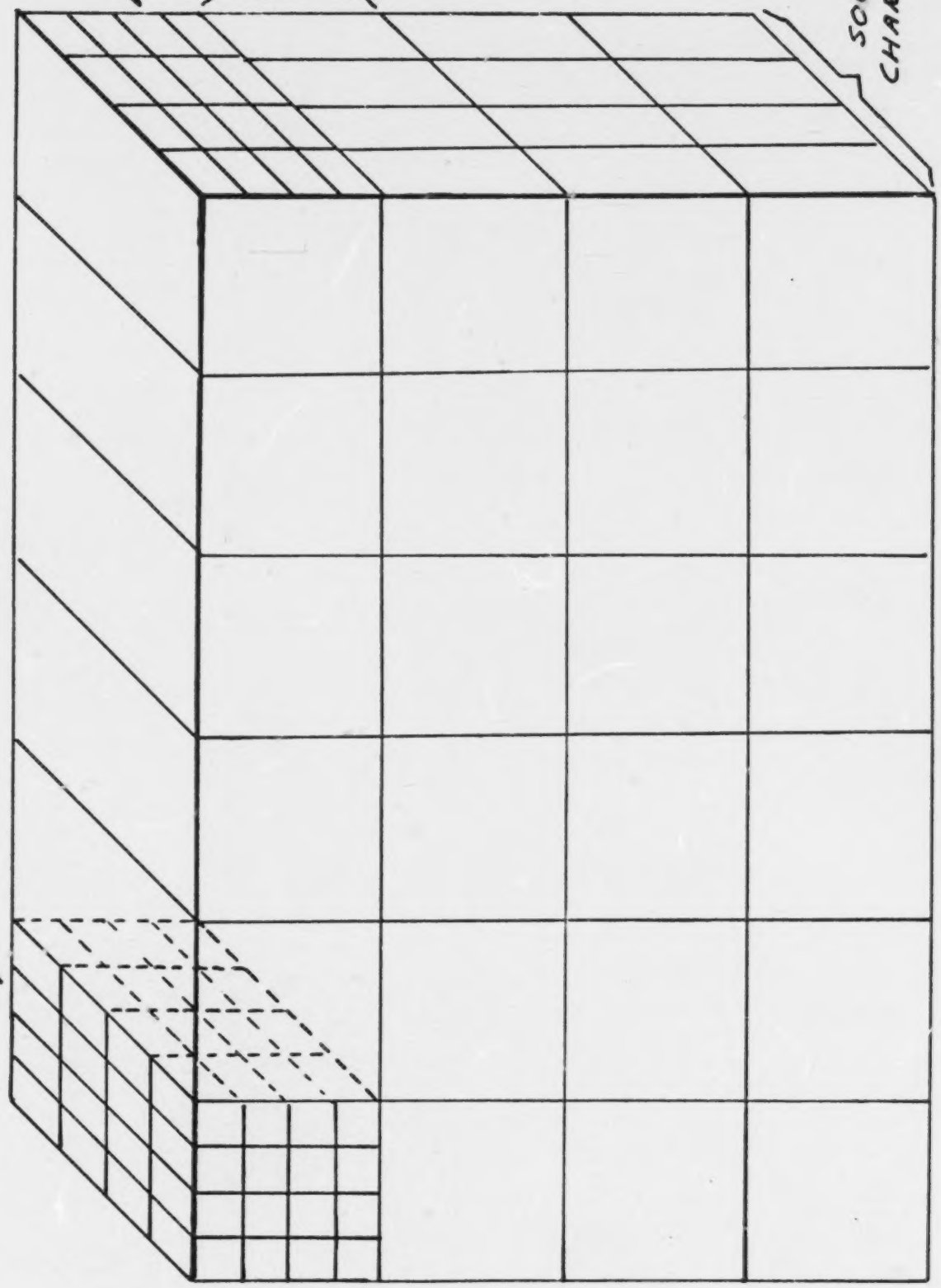

FIG. 1 A MULTI-DIMENSIONED BUDGETING FORMAT

Table 2

AN ABBREVIATED BUDGETING FORMAT

I. Student Development

A. Political Maturity

1. Freshman-Sophomore
   a. Department of Government
   b. Department of History
   c. Department of Political Science

2. Junior-Senior
   a. Department of Government
   b. Department of History

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3. Graduate
   a. Department of Government

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B. Social Maturity

1. Freshman-Sophomore
   a. College of Fine Arts
   b. Department of Sociology
   c. Department of Psychology

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2. Junior-Senior

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C. Economic Development

1. Freshman-Sophomore
   a. College of Business Administration
   b. College of Engineering

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II. Expansion of Knowledge

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Areas of Analysis

The simple categorization of resource allocations in higher education according to objectives produces a significant aid to planning. For the first time, an administrator is able to see clearly how trade-offs among departments have effects relating to the attainment of total system objectives. For example, increasing the budget of the Department of Fine Arts at the freshman-sophomore level at the expense of the Department of Business Administration can now be perceived as an alteration in emphasis from activities designed to enhance the economic development of students to those activities which increase their social maturity. While such relationships may have been understood intuitively in the past, the use of a program budgeting format makes explicit the implications of these actions.

Unfortunately, it seems doubtful that the tools of analysis associated with PPBS can be of much assistance in determining the proper allocation of resources among the programs designed to achieve the primary objectives of higher education. These programs are addressed to different objectives, and the problem of quantitatively determining the optimal level of an individual's political, social and economic development, of the efforts expended in the expansion of knowledge, and in public service is so involved with value judgments that a simple answer should not be expected.

However, within each of these categories, such techniques as cost-effectiveness analysis may be of value in attempts to determine "better" approaches to objective attainment. In addition, if the results indicate that even small improvements in the functioning of one of the programs is comparatively expensive, indicating high marginal costs, some consideration should be given to the shifting of resources to other programs where the response to increased resources is greater.

THE EFFECT OF PPBS ON ORGANIZATIONAL RELATIONSHIPS

This section will be concerned with the impact of PPBS on the relationships among the organizational units of a system of public higher education. The organizational structures of different systems

vary greatly, so that certain assumptions and definitions are required as an aid to the discussion. Each campus of a public higher education system will be considered to be composed of departments: authority on each campus will be referred to as the chancellor, while the total system of public higher education will be assumed to be the responsibility of the president. Finally, a committee serving as an interface between the state's government and the operating system will be assumed to exist, and will be designated as the coordinating board. The use of PPBS should have profound effects on the relationships among all of these centers of authority and responsibility.

Some authors have suggested that the use of PPBS centralizes authority within an organization. In actuality, while the result of its use may be an increase in the centralization of authority with respect to the previously existing arrangement, PPBS tends to restore the authority for decisionmaking to the originally intended units within the organizational structure by reducing the uncertainty inherent in decisions. For example, most budgeting systems for a campus are based on the requests for resources from the various department heads. Classical budgeting techniques make no attempt to assess the contribution of each department toward organizational goals. Thus, the chancellor of a campus has no rational basis on which to evaluate the requests from the departments. Such a situation generally results in a forced delegation of the chancellor's authority with regard to resource allocations to each department. Therefore, each department tends to develop autonomously with respect to the other departments and to the goals of the individual campuses. The power and the prestige of the department heads become the dominating factors in the competition for scarce resources.

The use of PPBS would require that requests for budgets be justified in terms of expected results. Even more important, the adoption of PPBS would require that the activities and contributions of all departments be evaluated as objectively as possible in terms of their contribution to the attainment of the goals of the campus. Such activity could result in significant changes in emphasis within each campus. In particular, the chancellor would be provided with the information

Similar remarks are valid with respect to all of the administrative relationships. Authority is restored to the originally intended organizational levels through the reduction of uncertainty in the decisions. For example, PPBS should better equip the president to make logical allocation decisions among the different campuses. Such questions as the following can be subjected to analysis: Should high quality upper-level and graduate courses in all areas be offered at all campuses, or should some campuses emphasize programs in the liberal arts while the others specialize in science and engineering?

The requirements of program justification do not imply that existing programs or future budget requests will be reduced. In fact, the opposite effect may result. For example, the dialogue between the coordinating board and the higher education system of a state should be enhanced by concrete proposals and estimates of their effects and their returns to the state. Certainly, the coordinating board would be willing to recommend the expansion of existing facilities or the construction of new campuses and institutions to a state legislature if such proposals were accompanied by competent studies revealing significant positive contributions to the state and her citizens.

Once again, the positions of both the coordinating board and the higher education system with respect to a state's government should be strengthened by PPBS. In times of rising taxes, legislatures are understandably hesitant to continue voting for increased spending in higher education without some idea of the benefits expected from such investments. However, budget requests accompanied by figures estimating the results of proposed programs in terms of increased voting rates, expected increases in individual incomes, expected increases in state tax revenues (which help offset a proportion of the costs), expected contribution to the trained manpower pool, etc., should receive much more favorable consideration.

Thus, the use of PPBS centralizes authority only to the extent that it helps return it to the originally intended level of the organization. In addition, the results of analysis should be a definite aid in justifying requests for resource allocations for worthy programs.

CONCLUSIONS

An attempt has been made to identify and analyze qualitatively the "costs" and "benefits" associated with the use of PPBS as an aid to planning and budgeting in a public system of higher education. While the costs were recognized as significant, the potential benefits also appear to be great.

The existing techniques of long-range planning currently in use in most public systems of higher education are of negligible value for evaluating alternative programs, and do not even question the suitability of the existing system. Therefore, another approach to planning seems desirable.

Although presenting no panacea, PPBS does offer a logical, objective-oriented approach to planning. Potentially, PPBS would allow administrators to evaluate the anticipated results of proposed programs and system alterations, and to compare results from different proposals in search of a "best," or satisficing," alternative. In addition, this form of analysis would allow requests for resources to be justified in terms of expected returns, as opposed to being ambiguously requested on the basis of 10 percent more than last year's budget. Thus, the relationships among the managerial units involved in a public system of higher education should be strengthened.

Although PPBS offers no escape from a reliance on managerial judgments, the more relevant information generated by its associated activities should improve both the perception and understanding of an exceedingly complex system. If so, the potential gains from the increased "effectiveness" of the decisionmaking should far outweigh the associated costs.

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